

09719153

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 08-252305

(43)Date of publication of application : 01.10.1996

(51)Int.Cl.

A61L 9/16
 A61L 9/01
 B01D 53/86
 B01D 53/86
 B01J 35/02
 D06M 11/46
 D06M 15/256

(21)Application number : 07-086343

(71)Applicant : AIWA:KK

(22)Date of filing : 16.03.1995

(72)Inventor : ARAKAWA TAMIO
 SAKURAI SHOJI

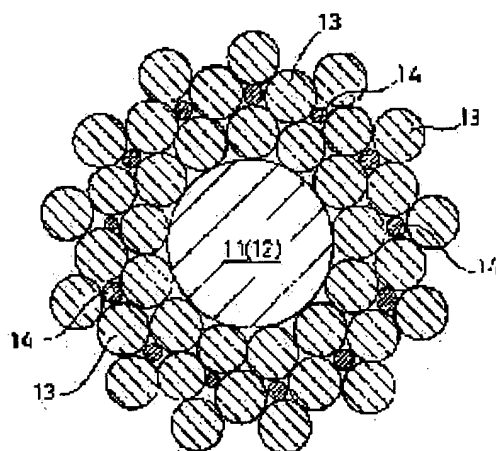
(54) AIR PURIFYING SHEET AND ITS MANUFACTURE

(57)Abstract:

PURPOSE: To provide an air purifying sheet excellent in durability and widely usable for interior goods or other articles by sticking polytetrafluoroethylene fine particles on the glass fiber circumference of glass fiber fabric, and holding a photocatalyst fine particle between the polytetrafluoroethylene fine particles.

CONSTITUTION: This air purifying sheet comprises polytetrafluoroethylene (PTFE) fine particles 13 stuck to the circumference of a glass fiber constituting glass fiber fabric 11, and a photocatalyst fine particle 14 consisting of titanium oxide fine particle or zinc oxide fine particle which is held in the clearance between the PTFE fine particles 13. It can be manufactured by applying an aqueous dispersion containing the photocatalyst fine

particle 14 and the PTFE fine particles 13 to the glass fiber fabric 11, and drying it followed by baking. This air purifying sheet can remove a bad smell contained in the ambient air and decompose bacteria therein only by being put in a sunny place. Because of its sheet form, it can be also used for surface skin materials for screen, cover of lamp, car seat or the like.



* NOTICES *

Japan Patent Office is not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the sheet for air cleaning which can disassemble or sterilize an impurity, bacteria, etc. in air under existence of light, and its manufacture method.

[0002]

[Description of the Prior Art] Disassembling impurities, such as nitrogen oxide in air and an odor, using the photocatalyst operation which the particle of titanium oxide or a zinc oxide has, or sterilizing bacteria in recent years is studied. For example, there are the tile and glass plate which printed the photocatalyst particle on the direct front face. However, the method which can be burn on a tile front face etc. at a direct elevated temperature in the aforementioned photocatalyst particle has the problem that cost is high. And since a tile sticks and curing etc. is needed in order to introduce into the existing interior of a room the tile which printed the photocatalyst particle, there is a problem which needs a large amount of construction costs.

[0003] Moreover, although **** in titanium oxide filled up with titanium oxide between the layers of the paper of multilayer structure is also known, the paper itself decomposes into **** by photocatalyst operation of titanium oxide, and there is a problem unsuitable for long-term use. In addition, applying to the front face of various goods the thing which made the room-temperature-curing type fluorine system paint which is hard to photodissociate distribute a titanium oxide particle is also proposed. However, the paint film which the paint followed on the surface of goods in this case is formed, and since a particle is prevented from titanium oxide contacting the open air, if it remains as it is, sufficient photocatalyst operation is not obtained. Then, although it is possible to delete the front face of a paint film and to expose a titanium oxide particle, when it does so, there is a problem which a titanium oxide particle becomes easy to drop out, and is inferior to practicality. Furthermore, the commercial fluorine system paint has the problem which decomposes gradually by the photocatalysis of a titanium oxide particle, and endurance cannot say is enough while it is expensive.

[0004]

[Problem(s) to be Solved by the Invention] Then, this invention is excellent in endurance and tends to offer the sheet for air cleaning which can moreover be broadly used for an indoor supply or other goods, and its easy manufacture method.

[0005]

[Means for Solving the Problem] There is two invention proposed here, a polytetrafluoroethylene particle adheres to the circumference of a glass fiber of a glass fiber fabric, and the first invention relates to the sheet for air cleaning with which the photocatalyst particle was held between these polytetrafluoroethylene particles.

[0006] Moreover, the second invention makes a glass fiber fabric apply and dry the aquosity distribution liquid containing a photocatalyst particle and a polytetrafluoroethylene particle, and relates to the manufacture method of the sheet for air cleaning characterized by calcinating. As a photocatalyst particle in the aforementioned first and the second invention, a titanium oxide particle or a zinc-oxide

particle, especially an anatase type titanium oxide particle are suitable.

[0007] First, material, a manufacturing process, etc. which are used for the sheet for air cleaning and its manufacture method of this invention are explained. The grain size of the photocatalyst particle used by this invention is suitably determined including powder, especially -- the application of aqueous distribution liquid (dispersion) -- in process, a thing 0.5 microns or less is desirable so that the photocatalyst particle in aqueous distribution liquid may not sediment quickly with gravity. In addition, a commercial photocatalyst activity titanium oxide particle fully satisfies this condition.

[0008] Moreover, although especially the grain size of the polytetrafluoroethylene (it is described as Following PTFE.) particle in the aqueous distribution liquid used by this invention is not limited, a thing 0.3 microns or less, especially about 0.2 microns are usually suitable for it so that distribution in the aforementioned aqueous distribution liquid may be made good and can moreover hold the aforementioned photocatalyst particle between PTFE particles by baking after an application.

[0009] The surfactant for making distribution of a photocatalyst particle and a PTFE particle easily and uniform is suitably contained in the aqueous distribution liquid (it is described also as the distributed liquid for an application below.) containing the aforementioned photocatalyst particle and a PTFE particle used by the manufacture method of this invention. Although manufacture of this distributed liquid for an application may add and stir the photocatalyst particle of the specified quantity in the PTFE distribution liquid of marketing obtained by carrying out the emulsion polymerization of the tetrafluoroethylene, preparing as follows is desirable. If the photocatalyst particle, the surfactant, and water of the specified quantity are stirred violently first, degree of dispersion will be raised using stirring meanses, such as an ultrasonic wave, if required, and this distributed liquid and PTFE distribution liquid are subsequently mixed, there will also be no condensation of the PTFE particle by too much stirring, and the quality distributed liquid for an application will be obtained.

[0010] Although the amount of the photocatalyst particle in the aforementioned distributed liquid for an application is suitably determined according to the use of this sheet for air cleaning etc., the photocatalyst particle 5 - its 100 weight sections are desirable to the PTFE particle 100 weight section. if the ratio of this photocatalyst particle increases more than this -- between the PTFE particles after an application -- a photocatalyst particle -- many -- intervening -- PTFE particles -- direct -- not contacting -- after baking -- a photocatalyst particle -- the front face of the sheet for air cleaning -- rubbing -- etc. -- it becomes easy to drop out. In addition, according to the use of this sheet for air cleaning etc., a heat-resistant pigment may be suitably added to the aforementioned distributed liquid for an application, and it may be colored the color of a request of the sheet for air cleaning.

[0011] The glass fiber fabric used by this invention wove the glass fiber, and was used as cloth, and selection use of a single fiber denier, a weave, the superintendent officer, etc. is suitably carried out [well-known] according to the use of this sheet for air cleaning. In addition, before this glass fiber fabric performs the application process which carries out a postscript, it is desirable to process at the elevated temperature of 400 degrees C or more, and to remove the organic substance on the front face of a glass fiber.

[0012] The application of the distributed liquid for an application to the aforementioned glass fiber fabric is chosen according to the thickness of a glass fiber fabric, a size, etc. from well-known application meanses, such as dip coating which dips a glass fiber fabric in the distributed liquid for an application, a spray method by the spray, or the roll coat method with a roll.

[0013] The dryness after an application is for carrying out evaporation removal of the moisture and surfactant in the applied aqueous distribution liquid, and is usually performed at about 150-250 degrees C. Moreover, subsequent baking is made in order to hold the aforementioned photocatalyst particle between the PTFE particle while combining the aforementioned PTFE particle and making it adhere to the circumference of a glass fiber in the shape of porosity. This burning temperature is made into the temperature which is below the temperature that a glass fiber fuses, and PTFE particles combine, and is usually made at about 350-450 degrees C. The desired sheet for air cleaning is obtained by the end of this baking process. In addition, softness is adjusted by the thickness of the glass fiber fabric which uses the sheet for air cleaning, the coating weight of PTFE, etc.

[0014] In addition, a series of processes of the aforementioned application, dryness, and baking are not restricted at once, but may be repeated the proper number of times. Repeating two or more times is desirable to make many especially photocatalyst particles hold and raise a photocatalyst operation more. Moreover, when repeating two or more times, you may change the rate of a compounding ratio of the photocatalyst particle of the aforementioned distributed liquid for an application for every number of times of the. As for especially the distributed liquid for an application used at the application process of the last round, it is desirable to make the rate of a compounding ratio of a photocatalyst lower than the rate of a compounding ratio of the photocatalyst in the distributed liquid for an application used at the application process till then. Then, the photocatalysis in which a photocatalyst particle stops having dropped out and a feeling of use was excellent over about [becoming good] or the long period of time with incurvation, friction, etc. of the sheet for air cleaning can be demonstrated.

[0015]

[Function] If it is in the sheet for air cleaning of this invention, the PTFE particle adhering to the glass fiber forms a detailed run through-hole between the particle, and a photocatalyst particle is held between the particle. Therefore, the light which shines upon the aforementioned sheet for air cleaning results in a photocatalyst particle through between PTFE particles, and activates the photolysis reaction of the photocatalyst particle. Moreover, the air near [aforementioned / for air cleaning] a sheet also results in a photocatalyst particle through between the aforementioned PTFE particles by the free convection etc., and a bad smell etc. is decomposed by the photolysis reaction.

[0016] Furthermore, a general organic material will deteriorate by photolysis operation for a short period of time, if light hits where the strong titanium oxide particle of a photocatalyst operation etc. is contacted. However, ultraviolet rays do not decompose PTFE with an exception, either. Therefore, if it is in the sheet for air cleaning of this invention that combined the PTFE particle and the glass textile which is inorganic material, even if a titanium oxide particle exists between PTFE particles, there is no possibility of deteriorating over a long period of time. In addition, since there are few possibilities that photocatalyst particles, such as a titanium oxide particle, may be held between PTFE particles, and the sheet for air cleaning of this invention may be omitted from the sheet for air cleaning, a good photolysis operation is obtained over a long period of time.

[0017] And in order to equip the sheet for air cleaning of this invention with chemical resistance, the highest thermal resistance, and the highest fire retardancy also in the synthetic macromolecule in which the above PTFE adhering to the circumference of the glass fiber which is excellent in fire retardancy is existing, the chemical resistance, the thermal resistance, and the fire retardancy which were excellent also about the sheet for air cleaning of this invention are acquired.

[0018]

[Example] The example of this invention is explained below. Drawing 1 is the expanded sectional view showing roughly the PTFE particle integrated state of the circumference of a glass fiber, and the maintenance state of a photocatalyst particle about an example of the sheet for air cleaning of this invention. In addition, this drawing is a schematic diagram and its size and number of a glass fiber 12, the PTFE particle 13, and the photocatalyst particles 14 are not exact, either. Moreover, as for the glass fiber 12, two or more [not only a single fiber but] may have become a bunch.

[0019] As shown in this drawing, the PTFE particle 13 has adhered to the circumference of the glass fiber 12 from which the sheet for air cleaning of this invention constitutes a glass fiber fabric 11. It joins together mutually, the PTFE particle 13 serves as the shape of porosity with the crevice which was open for free passage between the PTFE particles 13, and the photocatalyst particle 14 which becomes the aforementioned crevice from a titanium oxide particle or a zinc-oxide particle is held.

[0020] Next, the example of the manufacture method of the sheet for air cleaning of this invention is explained.

<Example 1> The solution which dissolved 150g (perfluoro OKUTANOIKKU acid ammonium) of surfactants in 5l. of pure water was prepared first. Stirring the solution violently with a propeller type agitator, 750g (tradename :P25 and company name:Japan Aerosil, Inc.) of photocatalyst activity titanium oxide was added, and it was made to distribute. And in the distributed liquid, it added and

PTFE distribution liquid (tradename : AD- 1, a company name : Asahi-AISHI eye fluoropoly Mars incorporated company) was mixed so that the titanium oxide content in a solid content (titanium oxide and PTFE) might become 5%, 10%, 20%, 40%, and 60%, and five kinds of distributed liquid for an application which consists of the aforementioned titanium oxide content was prepared.

[0021] On the other hand, the commercial glass fiber fabric (plain weave, 50g of superintendent officers/, m2, and circumstances are 50 [inch]) was heat-treated in 400-degree C hot blast for 8 hours, and the sizing agent was removed. And after carrying out the spraying application of the aforementioned distributed liquid for an application with a spray gun, it was made to dry at 200 degrees C to the glass fiber fabric for 30 minutes, it calcinated at 380 degrees C after that to it for 60 minutes, and the sheet for air cleaning was obtained to it.

[0022] Thus, for the obtained sheet for air cleaning, the aforementioned solid content is 2 1m of glass fiber fabrics. It was 25-35g of hits. Moreover, even if the titanium oxide particle was held by PTFE at the glass fiber of a glass fiber fabric in any case, the titanium oxide content in the aforementioned solid content bent about the thing to 40% or the sheet for air cleaning ground the front face, a titanium oxide particle did not drop out. However, about that whose titanium oxide content in the aforementioned solid content is 60%, the holding power to titanium oxide was weak, and defluxion of a titanium oxide particle was seen also by the grade which ground the sheet for air cleaning lightly. Therefore, the titanium oxide content in a solid content carried [measurement / following] out about 40% or less of thing.

[0023] About the sheet for air cleaning obtained with the <measurement 1> above, odor measurement of tobacco was performed with the smell sensor. As the measurement is shown in drawing 2 , in the airtight container 21 made from plastics of 150l. of content volume The 33x30-centimeter sample (sheet for air cleaning obtained above) 22 Separate from the 10W mercury-vapor lamp 23 of a putting-out-lights state 20 centimeters, and it hangs from container 21 ceiling. Turning on the aforementioned mercury-vapor lamp 23 and continuing the aforementioned stirring further, after blowing cigarette smoke for 5 seconds in the state, stirring the inside of a container 21 by the blower 24 for stirring for 1 hour and cigarette smoke's being full uniformly in a container 21 The odor of tobacco was measured with the smell sensor (the product made from the new cosmos electrical and electric equipment, XP329) 25, and the time progress after mercury-vapor lamp 23 lighting and the relation of odor were recorded with the recorder 26 for smell sensors. The numeric value of a smell sensor becomes small for a short time, so that the content of the titanium oxide in a solid content is size as shown in Table 1, and the result is understood that cigarette smoke is decomposed quickly.

[0024]

[Table 1]

固形分中の酸化チタン 含 有 率	ニオイセンサーの数値が550から 250に低下するのに要した時間
5 %	600 分 以上
10 %	180 分
20 %	80 分
40 %	48 分

[0025] <Measurement 2> It measured as follows also about decomposition of an acetaldehyde again. In the stainless steel container of 3l. of content volume, stirring wings and the 10W mercury-vapor lamp

have been arranged, and the 10x10-centimeter sample has been arranged in the position separated from the mercury-vapor lamp 10 centimeters. And the steam of an acetaldehyde is poured in with a syringe into the container, and it was made for the acetaldehyde concentration in a container to be set to about 250 ppm. And the acetaldehyde concentration in a container was measured by the gas chromatograph every 5 minutes, turning on the aforementioned mercury-vapor lamp and rotating stirring wings. Consequently, the rapid fall of acetaldehyde concentration was accepted with lighting of a mercury-vapor lamp. Moreover, it turns out that it falls for a short time, so that the content of the titanium oxide in a solid content was size as shown in Table 2 when the time taken to plot the result in a graph and to fall from 200 ppm to 100 ppm was read in the graph.

[0026]

[Table 2]

固形分中の酸化チタン 含 有 率	アセトアルデヒド濃度 200 ppm から 100 ppm に低下するのに要した時間
5 %	120 分 以上
10 %	65 分
20 %	37 分
40 %	25 分

[0027] In addition, although the case where a zinc-oxide particle is used as the aforementioned photocatalyst particle is not shown in detail, if it is made to be the same as that of the above, the sheet for air cleaning will be obtained easily.

[0028]

[Effect of the Invention] As it illustrates above and being explained, according to the sheet for air cleaning of this invention, disassembly of removal of the bad smell contained in the air of the circumference, bacteria, etc. can be performed only by putting on the place where light hits. And since it has the shape of a sheet like cloth, it can use for various goods, such as epidermis material, such as covering of screens, such as a curtain and partition, and an electric light, and an automatic sitting in a circle seat.

[0029] Furthermore, since the photocatalyst particle is held by PTFE with the sheet for air cleaning of this invention strong against ultraviolet rays or a chemical, the endurance over ultraviolet rays is high, also by long-term use, there is no degradation of PTFE, there is no defluxion of a photocatalyst particle, and the air cleaning operation which was excellent over the long period of time is obtained.